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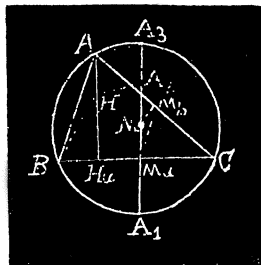
Solution by F. M. McGAW, A. M., Professor of Mathematics, Bordentown Military Institute, Bordentown, New Jersey, and the PROPOSER.

Let  $M_a A_1 = M_a A_2$ ,  $A_2 A_3 = AH$ , to prove  $A_3$  on the circumference of the circle. Since  $A_2 A_3$  is a line through  $M$ , the center of the circle, the proposition is in effect to prove  $A_3$  one extremity of the diameter through  $M_a$ .

By the conditions  $AH = A_2 A_3$ , and is parallel to it, therefore  $AHA_3 A_2$  is a parallelogram.

Also triangles  $BHA$  and  $M_a M M_b$  are similar, hence since  $2M_a M_b = AB$ , we have  $AH = 2MM_a$ .

$$\begin{aligned} \text{Therefore, } A_1 A_3 &= A_2 A_3 + A_2 M_a + M_a A_1 \\ &= AH + 2M_a A_1 \\ &= 2M_a M + 2M_a A_1 \\ &= 2(MA_1) = 2r, \text{ hence } A_3 \text{ is extremity of diameter.} \end{aligned}$$



Q. E. D.

Also solved by CHAS. C. CROSS, and J. W. SCROGGS.

Mr. Cross furnished two different solutions.

72. Proposed by O. W. ANTHONY, M. Sc., Professor of Mathematics, Columbian University, Washington, D. C.

If a line with its extremities upon two curves move in any manner whatever, (the line may vary in length), and  $P$  a point upon the line which divides it in the ratio  $m:n$  describe a curve, the area of this curve will be given by the formula—

$$A = \frac{(m^2 + nm)A_1 + (n^2 + mn)A_2 - mnA_3}{(m+n)^2}.$$

No solution of this problem has been received.

73. Proposed by ROBERT J. ALEY, A. M., Ph. D., Professor of Mathematics, Indiana University, Bloomington, Indiana.

Prove by pure geometry: (1)  $A'$ ,  $B'$ , and  $C'$  are the middle points of the arcs  $BC$ ,  $CA$ , and  $AB$  respectively. With these points as centers, circles are described passing through  $B$  and  $C$ ,  $C$  and  $A$ , and  $A$  and  $B$  respectively. Prove that these circles intersect in  $O$ , the center of the incircle of the triangle  $ABC$ ; (2) that  $O$ , the center of the incircle, is Nagel's point of the triangle formed by joining the middle points of the sides.

Solution by CHARLES C. CROSS, Laytonsville, Maryland, and the PROPOSER.

(1)  $AO$  cuts the circumcircle at  $A'$ , for  $AO$  bisects angle  $A$  and also its subtending arc.  $\angle OBA' = \frac{1}{2}(A+B)$ .

$\angle BOA' = \frac{1}{2}(A+B)$  for it is exterior angle to triangle  $BOA$ .

$\therefore$  triangle  $A'BO$  is isosceles.

$A'B = A'O$ . By similar reasoning it is proved that  $B'A = B'O$  and  $C'A = C'O$ .

$\therefore$  The circles intersect in  $O$ .

(2) It is a well known property of Nagel's point that  $AQ$  and  $OM_a$ ,  $BQ$  and  $OM_b$ ,  $CQ$  and  $OM_c$  are respectively parallel.

